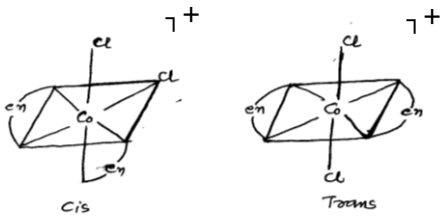
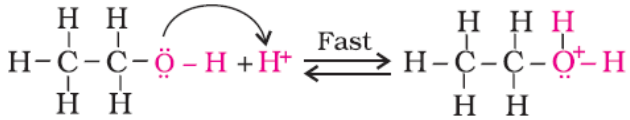
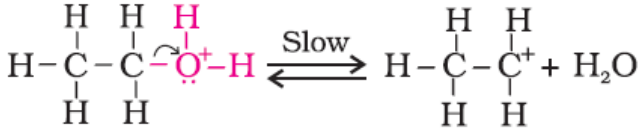
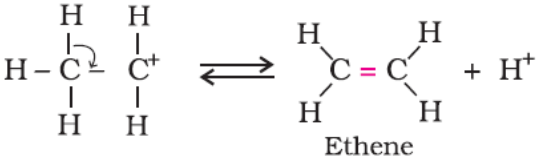
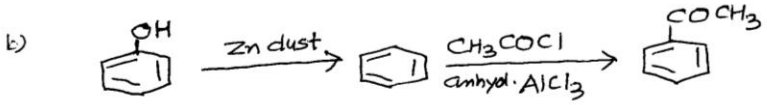
CHEMISTRY MARKING SCHEME
SET-56/3(AN)

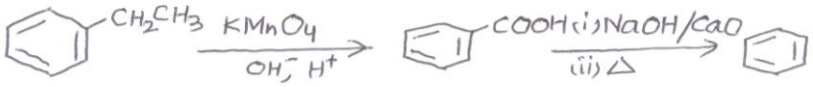
Q no.	Answers	Marks
1	It is first order of reaction	1
2	$AlCl_3$	1
3	$XeOF_4$	1
4	$6\,NaOH + 3Cl_2 \xrightarrow{\Delta} 5\,NaCl + NaClO_3 + 3H_2O$	1
5	$[Cr(en)_3][Co(CN)_6]$	1
6	Heat both the compounds with I_2 and NaOH Propan-2-ol gives yellow ppt. of Iodoform (or any other test)	1
7	4-oxopentanal	1
8	It increases the pulse rate and blood pressure.	1
9	$d = \frac{z \times M}{a^3 \times N_A}$ For fcc lattice z = 4 a = distance $\times \sqrt{2}$ = 287 pm x 1.414 = 406 pm $d = \frac{4 \times 108\ g\ mol^{-1}}{(4.06 \times 10^{-8}\ cm)^3 \times 6.022 \times 10^{23}\ mol^{-1}}$ $d = 10.72\ g\,cm^{-3}$	½ ½ 1
10	(i) Ambident Nucleophile: Nucleophiles with two nucleophilic centres are called ambident nucleophile. ex. CN^-, NO_2^- (any one example) (ii) Finkelstein reaction: $CH_3\text{-}CH_2\text{-}Cl + NaI \rightarrow CH_3CH_2I + NaCl$	½+½ 1
11	(a) Because of resonance in CH_3CONH_2, N acquires +ve charge whereas due to +I effect electron density on N increases in $CH_3CH_2NH_2$ (b) Because of strong activation effect or +R effect of NH_2 group in aromatic amines. (or can be explained by diagrammatic representation)	1+1
12	(a) Add aq. KOH followed by 2,4-DNP to both the compounds. 1,1-dichloroethane gives yellow ppt. (or any other correct test)	1

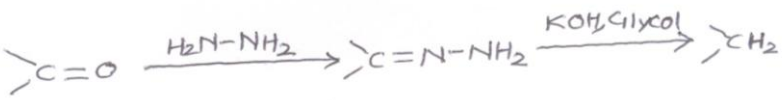
	(b) $CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{CH_3MgBr/H_3O^+} CH_3COCH_3$ (or by any other suitable method)	1
13	(i) $CH_3-CH_2-CH_2NH_2$ (ii) $CH_3-\underset{\displaystyle NH_2}{\underset{|}{CH}}-CH_3$ (iii) $CH_3-CH_2-NH-CH_3$ (iv) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{N}}-CH_3$ (At least 3 correct structures should be written) Propanamine and 2-aminopropane	½x3= 1 ½ ½
14	(a)  (b) sp^3d^2, octahedral / It is an outer orbital octahedral complex with sp^3d^2 hybridisation.	½ + ½ ½ + ½
15	1. Diode is a combination of n-type and p-type semi conductors and is used as rectifier. 2. npn and pnp type of transistors are used to detect or amplify radio or audio signals. 3. The solar cell is an efficient photo diode used for conversion of light energy to electrical energy. (any two)	1+1

16	The activated complex has a transient existence and breaks up at a definite rate to form the product. The energy required to form activated complex is called activation energy. OR The rate of reaction is defined as the change in concentration of reactants or products per unit time. or mathematical expression If the rate is measured in larger time interval (Δt) then it is called average rate whereas if the rate is measured in very small time interval ($\Delta t \to 0$) then it is called instantaneous rate.	1+1 1 ½+½
17	$\log \frac{[R]_1}{[R]_2} = \frac{k(t_2 - t_1)}{2.303}$ $k = \frac{2.303}{(t_2 - t_1)} \log \frac{[R]_1}{[R]_2}$ $= \frac{2.303}{(60\,\text{min} - 0\,\text{min})} \log \frac{1.24 \times 10^{-2}\,\text{mol L}^{-1}}{0.20 \times 10^{-2}\,\text{mol L}^{-1}}$ $= \frac{2.303}{60} \log 6.2\,\text{min}^{-1}$ $k = 0.0304\ \text{min}^{-1}$	½ 1 ½
18	(i) Because the ions present in saline water enhance the electrochemical process of rusting. (ii) Because the number of ions per unit volume decreases with dilution.	1+1
19	(i) Homogeneous Catalysis: The catalytic process in which the reactants and catalyst are in the same phase is known as Homogeneous catalysis. (ii) Enzyme Catalysis: The process of catalysis in which enzymes are used to increase the rate of biochemical reactions. (iii) Associated Colloids: Some of the substance behave as electrolytes at low concentration but behave as colloid at higher concentration	1 1 1
20	(i) Because of discrete tetrahedral structure of white phosphorus. (ii) Because of interelectronic repulsion in F_2 due to its shorter bond length. (iii) Because Bi is more stable in trivalent state.	1x3=3

21	Homopolymers	Copolymers	
	Polymers whose repeating structural units are derived from only one type of monomers units. ex. Polythene, PVC etc	Polymers whose repeating structural units are derived from two or more types of monomer molecules. ex. Nylon 6,6, Buna-S etc (or any other example)	1+1
	(b) PVC (Polyvinyl Chloride)		1
22	$Ag^+ + e^- \rightarrow Ag$ 108 g is deposited by 96500 C electric charge 1.45 g of silver is deposited by $\frac{96500\ C \times 1.45\ g}{108\ g} = 1295.6\ C$		1
	Quantity of electricity passed = Current x t $t = \frac{1295.6\ C}{1.5\ amp} = 863.7\ s$		1
	$Cu^{2+} + 2e^- \rightarrow Cu$ 2 x 96500 C deposits 63.5 g of Cu 1295.6 C deposits $\frac{63.5g \times 1295.6\ C}{2 \times 96500\ C}$ of Cu		
	= 0.426 g of Cu		½
	$Zn^{2+} + 2e^- \rightarrow Zn$ 2 x 96500 C deposits 65.4 g of Zn 1295.6 C deposits $\frac{65.4g \times 1295.6\ C}{2 \times 96500\ C}$ of Zn		½
	= 0.44 g of Zn		
22	OR		
	$E_{cell}^{o} = E_{cathode}^{o} - E_{anode}^{o}$		
	= 0.34 V - (-0.76) V = +1.10 V		1
	$\Delta G^{o} = - nFE^{O}_{cell}$		½
	$= - 2 \times 96500\ C\ mol^{-1} \times 1.10\ V$ $= - 213.3\ kJ\ mol^{-1}$		½ 1

23	Limited Spectrum Antibiotics: They are effective against a single organism or disease. ex. Penicillin G Antioxidants: Chemical substances which prevent the oxidation in food stuff etc. are called antioxidants. ex. BHA (or any other example) Tranquilizers: Drugs which act on central nervous system and thus help in reducing anxiety are called tranquilizers. ex. Equanil, Seconal, luminal etc (or any other example)	½ + ½ ½ + ½ ½ + ½
24	**(a)** The impure Ni is heated with carbon monoxide (CO) to form volatile compound $Ni(CO)_4$ which on further heating decomposes at higher temperature gives pure Ni. (b) Because of higher entropy in liquid state. (c) NaCN is used for the leaching of silver ore in the presence of air to form a soluble complex.	1x3=3
25	(a)    Ethene (b)  	½ ½ 1 1

26	(i) Ram: Kind and helpful Police: Bound to their duty and helpful (ii) -In the manufacture of fertilizers -In petroleum refining -In detergent industry -In storage batteries	½+½ ½x4=2
27.	(b) Proteins which consist of linear thread like molecules which lie side by side. ex. Insulin, albumins (any one) (c) Nucleic acids are polymers of nucleotides. Function: They are responsible for transfer of genetic information from one generation to the other./ protein synthesis (any one function)	1 ½ 1 ½
28.	(a) A=$(CH_3CO)_2O$ C=$CH_3COOC_2H_5$ E=CH_3COCH_3 B=CH_3COOH D=C_2H_5OH (b) (i) **Propanol and Propanone**: Propanone gives yellow ppt of Iodoform (CHI_3) on addition of NaOH/ I_2 whereas Propanol does not give this test. ***(or any other suitable test)*** (ii) Because carbon of carboxyl group is less electrophillic. OR	1 ½ 1 ½ 1 1
28	(a) (i)  (ii) $CH_3COCH_3 \xrightarrow{LiAlH_4} CH_3-\underset{OH}{CH}-CH_3 \xrightarrow{Conc.\ H_2SO_4} CH_3-CH=CH_2$ (or any other correct suitable method)	 1+1

	(b) (i) Because - COOH is a deactivating group. (ii) Because one NH_2 is involved in resonance with carbonyl group.	1+1
	(c)  	1
29.	(a) $$\text{Molality of sugar solution} = \frac{n_{C_{12}H_{22}O_{11}}}{W_{H_2O}\text{ (in grams)}} \times 1000$$	½
	$= \frac{5}{342} \times \frac{1000}{100} = 0.146$ m ΔT_f for sugar solution = 273.15 K – 271 K = 2.15 K $\Delta T_f = K_f \times m$ $\therefore K_f = \frac{\Delta T_f}{m} = \frac{2.15}{0.146}$ K kg mol^{-1}	1
	Molality of glucose solution $= \frac{n_{C_6H_{12}O_6}}{w_{H_2O}\text{ (in grams)}} \times 1000$ $= \frac{5}{180} \times \frac{1000}{100} = 0.278$ mol kg^{-1} $\Delta T_f = K_f \times m$ $\therefore \Delta T_f$ (Glucose) $= \frac{2.15}{0.146}$ K kg mol^{-1} × 0.278 mol kg^{-1} = 4.09 K	1
	∴ Freezing point of glucose solution = 273.15 K – 4.09 K = **269.06 K.** **Calculate the mass of**	½
	(b) Henry's law states that at a constant temperature, the solubility of a gas in a liquid is	

directly proportional to the pressure of the gas over the solution. 1

Applications

(i) To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under high pressure.

(ii) Scuba divers must cope with high concentrations of dissolved Nitrogen with breathing air at high pressure under water. To avoid this air is diluted with He. ½

(iii) At high altitudes the partial pressure of oxygen is less than that at the ground level. +½

Low blood oxygen causes anoxia.

(any two)

29 OR

no. of moles of benzene $(n_B) = \frac{23.4\,g}{78\,g\,mol^{-1}} = 0.3$

no. of moles of toluene $(n_T) = \frac{64.4\,g}{92\,g\,mol^{-1}} = 0.7$

$\therefore x_B = \frac{n_B}{n_B + n_T} = \frac{0.3}{0.3+0.7} = 0.3$ ½

$x_T = 0.7$ ½

$p_B = p_B^\circ \cdot x_B = 75\,mm \times 0.3 = 22.5\,mm$ ½

$p_T = p_T^\circ \cdot x_T = 22\,mm \times 0.7 = 15.4\,mm$ ½

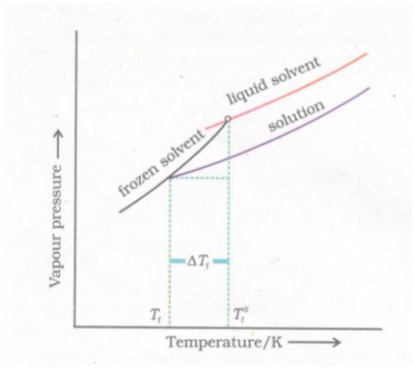
Total V.P of solution = 22.5 + 15.4

= 37.9 mm

Mole fraction of Benzene in vapour phase

$= \frac{\text{Partial V.P of Benzene}}{\text{Total V.P of solution}}$

$= \frac{22.5}{37.9} = 0.6$ 1

	(b)  On adding non volatile solute vapour pressure of solution decreases. Therefore to freeze the solution temperature has to be lowered down causing depression of freezing point.	1 1
30.	(a) Because of Lanthanoid contraction. (b) Because of the presence of unpaired electrons there is strong metallic bonding and thus have high enthalpy of atomization. (c) Because Mn^{2+} is more stable due to half filled $3d^5$ whereas Cr^{3+} is stable due to half filled t_{2g}^3 orbital. (d) Because of the absence of unpaired electrons. (e) Because of half filled stable $3d^5$ configuration.	1x5=5
	OR	
30	(a) $4\,FeCr_2O_4 + 8\,Na_2CO_3 + 7O_2 \rightarrow 8\,Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$ $2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + 2Na^+ + H_2O$ $Na_2Cr_2O_7 + 2\,KCl \rightarrow K_2Cr_2O_7 + 2NaCl$ Dichromate ion changes to chromate ion on increase in pH (b) The steady decrease in atomic radii with increase in atomic number is called lanthanoid contraction.	1 ½ ½ 1

	consequences: 5d series elements have nearly same atomic radii as that of 4d series elements. (c) Because of the presence of unpaired electrons.	1 1

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